

Amendment Under 37 C.F.R. § 1.111  
Appln. No.: 10/018,790

**AMENDMENTS TO THE CLAIMS**

This listing of claims will replace all prior versions and listings of claims in the application:

**LISTING OF CLAIMS:**

1 (currently amended): A method for preparing a cross-linked and/or functionalized bitumen/polymer compositions with composition having a low susceptibility to temperature, comprising wherein, when operating at temperatures that range between 100°C and 230°C and under agitation,

forming at temperatures in the range between 100°C and 230°C, and under agitation, a homogenous mass that represents the bitumen/polymer composition and is made of comprising a bituminous matrix in which is uniformly dispersed a precursor elastomer cross-linked and/or functionalized elastomer, and

crosslinking and/or functionalizing said precursor elastomer to form said cross-linked and/or functionalized bitumen/polymer composition.

wherein said made from a precursor elastomer is used in a quantity that ranges of between 0.5% and 30% of the weight of the bituminous matrix,

and where said method is characterized by making the said bituminous matrix is made by associating, by weight, x% of a non oxidized bitumen with a penetrability that ranges of between 20 and 900 and y% of an oxidized bitumen, with a penetrability that ranges of between 10 and 90, where said penetrabilities are determined as set forth the in NF standard T 66004 and are

Amendment Under 37 C.F.R. § 1.111  
Appln. No.: 10/018,790

expressed in  $x/10$  mm, where the values of  $x$  and  $y$  are such that  $20 \leq x \leq 95$  and  $5 \leq y \leq 80$  with  $x + y = 100$ .

2 (currently amended): The method as set forth in claim 1, ~~characterized in that the~~  
~~wherein weight percentages  $x\%$  of non-oxidized bitumen and  $y\%$  of oxidized bitumen, associated~~  
~~to form the bituminous matrix of the bitumen/polymer composition the values of  $x$  and  $y$  are~~  
such that  $35 \leq x \leq 85$  and  $15 \leq y \leq 65$  with  $x + y = 100$ .

3 (currently amended): The method as set forth in claim 1, ~~characterized in that wherein~~  
the quantity of the precursor elastomer represents is from 1.5% to 20% of the weight of the  
bituminous matrix.

4 (currently amended): The method as set forth in claim 1, ~~characterized in that wherein~~  
the non oxidized bitumen, ~~entering in the making of the bituminous matrix,~~ consists of one single  
bitumen or of a mixture of bitumens ~~taken from among~~ selected from the group consisting of the  
straight-run bitumens, the refinery bitumens under reduced pressure, the propane or pentane  
deasphalting residues and viscosity breaking residues.

5 (currently amended): The method as set forth in claim 4, ~~characterized in that wherein~~  
the non oxidized bitumen is one bitumen or a mixture of bitumens ~~taken from among the~~  
straight-run bitumens.

6 (currently amended): The method as set forth in claim 1, ~~characterized in that wherein~~  
the oxidized bitumen, ~~associated with the non-oxidized bitumen to make up the bituminous~~  
~~matrix,~~ consists of one single oxidized bitumen or of a mixture of oxidized bitumens ~~taken from~~  
~~among~~ selected from the group consisting of the blown bitumens and the semi-blown bitumens.

Amendment Under 37 C.F.R. § 1.111  
Appln. No.: 10/018,790

7 (currently amended): The method as set forth in claim 1, ~~characterized in that wherein~~ the penetrability of the non oxidized bitumen, ~~used in making the bituminous matrix, ranges is~~ between 35 and 500.

8 (currently amended): The method as set forth in claim 1, ~~characterized in that wherein~~ the penetrability of the oxidized bitumen, ~~used in making the bituminous matrix, ranges is~~ between 20 and 60.

9 (currently amended): The method as set forth in claim 1, ~~characterized in that wherein~~ the oxidized bitumen, ~~associated with the non oxidized bitumen to make the bituminous matrix,~~ has a ring and ball softening point as defined in the NF standard T 66008, ~~that ranges of~~ between 50°C and 120°C.

10 (currently amended): The method as set forth in claim 1, ~~characterized in that wherein~~ the precursor elastomer consists of at least one copolymer ~~chosen from among the selected from~~ the group consisting of random ~~or~~ and block copolymers of styrene and of a conjugated diene, namely butadiene, isoprene, chloroprene, carboxylic butadiene or carboxylic isoprene.

11 (currently amended): The method as set forth in claim 10, ~~characterized in that~~ wherein the precursor elastomer consists of one or several more copolymers ~~chosen from among~~ the selected from the group consisting of linear ~~or~~ and star block copolymers, with or without a random hinge, of styrene and of butadiene, of styrene and of isoprene, of styrene and of chloroprene, of styrene and of carboxylic butadiene or ~~alternatively~~ of styrene and of carboxylic isoprene.

Amendment Under 37 C.F.R. § 1.111  
Appln. No.: 10/018,790

12 (currently amended): The method as set forth in claim 10, ~~characterized in that~~ wherein the copolymers of styrene and of conjugate diene have a styrene content ~~that range of~~ between 5% and 50% by weight.

13 (currently amended): The method as set forth claim 10, ~~characterized in that~~ wherein the copolymers of styrene and of conjugated diene have, prior to the cross-linking and/or functionalization, a weight average molecular weight masses by weight that range of between 10 000 daltons and 600 000 daltons.

14 (currently amended): The method as set forth in claim 1, ~~characterized in that it~~ consists in ~~putting~~ wherein the non oxidized bitumen and the oxidized bitumen ~~chosen to make~~ the bituminous matrix ~~in contact~~ are contacted with, by weight of said bituminous matrix, 0.5% to 30% of the precursor elastomer and 0.01% to 6% of a cross-linking agent and/or a functionalization agent while working at temperatures ~~that range of~~ between 100°C and 230°C and under agitation for a period of time of at least 5 minutes.

15 (currently amended): The method as set forth in claim 14, ~~characterized in that~~ wherein the precursor elastomer is ~~put in contact~~ contacted with the non oxidized and the oxidized bitumens while working at temperatures ~~ranging of~~ between 100°C and 230°C and under agitation for a period of time ~~ranging of~~ from 5 minutes to 8 hours, to create a homogenous mixture, then incorporating the cross-linking agent and/or functionalization agent is ~~incorporated into said mixture and it is all kept~~ while under agitation at temperatures ~~ranging of~~ between 100°C and 230°C, and ~~identical or not to the temperatures at which the precursor elastomer is mixed with the non oxidized and the oxidized bitumens used to make the~~

Amendment Under 37 C.F.R. § 1.111  
Appl. No.: 10/018,790

~~bituminous matrix~~, for a period of time ~~that ranges of~~ between 5 minutes and 5 hours, to form a reaction product that makes up the cross-linked and/or functionalized bitumen/polymer composition.

16 (currently amended): The method as set forth in claim 1, ~~characterized in that it consists, comprising~~, in a first phase, ~~in preparing a concentrate by putting from~~ by contacting 50% to 100% of the non oxidized bitumen ~~to be used to make the bituminous matrix in contact~~ with, by weight of said bituminous matrix, 5% to 30% of the precursor elastomer and 0.01% to 6% of a crosslinking agent and/or a functionalization agent to form a cross-linked and/or functionalized bitumen/polymer reaction product that makes up said concentrate while working at temperatures ~~ranging of~~ between 100°C and 230°C under agitation during a period of time of at least 5 minutes and then, in a second phase, ~~in~~ diluting the cross-linked and/or functionalization bitumen/polymer reaction that resulted from the first phase and adding to it the oxidized bitumen and the possible remaining fraction of non oxidized bitumen, while operating at temperatures ~~that range of~~ between 100°C and 230°C, under agitation, to form the cross-linked and/or functionalized bitumen/polymer composition.

17 (currently amended): The method as set forth in claim 16, ~~characterized in that wherein~~ the first phase is carried out by ~~putting~~ contacting the precursor elastomer ~~in contact~~ with the non oxidized bitumen, while working at temperatures ~~that range of~~ between 100°C and 230°C, and under agitation for a period of time from 5 minutes to 8 hours, to form a homogenous mass, then in adding to said ~~mixture~~ homogenous mass the cross-linking agent and/or the functionalization agent and holding it all under agitation temperatures ~~that range of~~ between

Amendment Under 37 C.F.R. § 1.111  
Appln. No.: 10/018,790

100°C and 230°C, and identical or not to the temperatures at which the precursor elastomer is mixed with the non-oxidized bitumen, for a period of time that ranges of from 5 minutes to 5 hours, to form the cross-linked and/or functionalized bitumen/polymer reaction product.

18 (currently amended): The method as set forth in claim 14, characterized in that wherein the functionalized elastomer is created within the bituminous matter using a precursor elastomer is functionalized within the bituminous matter matrix with a functionalization agent selected from the group consisting of carboxylic acids or esters bearing thiol or disulfide groups and thiolcarboxylic acid polyesters.

19 (currently amended): The method as set forth in claim 1, characterized in that wherein the precursor elastomer is functionalized and one or several more reactive additives likely to react with the functional groupings groups of the elastomer are incorporated into the functionalized bitumen/polymer composition during its preparation where the quantity of the reactive additive(s) ranges is from 0.01% to 10% of the weight of the bitumen present in the composition.

20 (currently amended): The method as set forth in claim 14, characterized in that wherein the precursor elastomer is cross-linked elastomer is created within the bituminous matrix, using a cross-linking agent selected from the group consisting of a sulfur donor cross-linking agents agent and a peroxidized compounds that generate generates a free radicals radical at temperatures ranging of between 100°C and 230°C.

21 (currently amended): The method as set forth in claim 1, further incorporating one or several more additional polymers that are different from the precursor elastomer to the cross-

Amendment Under 37 C.F.R. § 1.111  
Appln. No.: 10/018,790

linked and/or functionalized bitumen/polymer composition in an overall ~~quantity that ranges~~  
amount of between 0.3% and 20% of the weight of the bitumen of said compositions.

22 (previously presented): A road surface pavement or a watertight facing made from a cross-linked and/or functionalized bitumen/polymer composition made from the method of claim 1.

23 (currently amended): The method as set forth in claim 7, ~~characterized in that wherein~~  
the penetrability of the non oxidized bitumen, ~~used in making the bituminous matrix,~~ ranges is  
between 160 and 330.

24 (currently amended): The method as set forth claim 13, ~~characterized in that wherein~~  
the copolymers of styrene and of conjugated diene have, prior to the cross-linking and/or functionalization, a weight average molecular weight masses by weight that range of between 30 000 daltons and 400 000 daltons.

25 (currently amended): The method as set forth in claim 14, ~~characterized in that~~  
wherein it consists in putting the non oxidized bitumen and the oxidized bitumen ~~chosen to make~~  
~~the bituminous matrix in contact~~ are contacted with, by weight of said bituminous matrix, 1.5% to 20% of the precursor elastomer and 0.05% to 3% of cross-linking agent and/or a functionalization agent while working at temperatures ~~that range of~~ of between 130°C and 200°C and under agitation for a period of time of at least 5 minutes.

26 (currently amended): The method as set forth in claim 15, ~~characterized in that~~  
wherein the precursor elastomer is put in contact with the non oxidized and the oxidized bitumens while working at temperatures ~~ranging of~~ of between 130°C and 200°C and under

Amendment Under 37 C.F.R. § 1.111  
Appln. No.: 10/018,790

agitation for a period of time ranging from 30 minutes to 6 hours, to create a homogeneous mixture, then the cross-linking agent and/or functionalization agent is incorporated into said mixture ~~and it is all kept~~ while under agitation at temperatures ~~ranging of~~ between 130°C and 200°C, ~~and identical or not to the temperatures at which the precursor elastomer is mixed with the non-oxidized and the oxidized bitumens used to make the bituminous matrix,~~ for a period of time ~~that ranges~~ between 10 minutes and 180 minutes, to form a reaction product that makes up the cross-linked and/or functionalized bitumen/polymer composition.

27 (currently amended): The method as set forth in claim 16, ~~characterized in that it consists comprising, in a the first phase, in preparing a concentrate by putting contacting~~ from 50% to 100% of the non oxidized bitumen ~~to be used to make the bituminous matrix in contact~~ with, by weight of said bituminous matrix, 5% to 30% of the precursor elastomer and 0.05% to 3%, of a cross-linking agent and/or a functionalization agent to form a cross-linked and/or functionalized bitumen/polymer reaction product that makes up said concentrate while working at temperatures ~~ranging of~~ between 130°C and 200°C, under agitation during a period of time of at least 5 minutes and then, in a the second phase, ~~in~~ diluting the cross-linked and/or functionalization bitumen/polymer reaction that resulted from the first phase and adding to it the oxidized bitumen and the possible remaining fraction of non oxidized bitumen, while operating at temperatures ~~that range of~~ between 130°C and 200°C, under agitation, to form the cross-linked and/or functionalized bitumen/polymer composition.

28 (currently amended): The method as set forth in claim 17, ~~characterized in that~~ wherein the first phase is carried out by ~~putting~~ contacting the precursor elastomer ~~in contact~~



Amendment Under 37 C.F.R. § 1.111  
Appln. No.: 10/018,790

with the non oxidized bitumen, while working at temperatures ~~that range of~~ between 130°C and 200°C, and under agitation for a period of time from 30 minutes to 6 hours, to form a homogenous mass, then in adding to said ~~mixture~~ homogenous mass the cross-linking agent and/or the functionalization agent and holding it all under agitation at temperatures ~~that range of~~ between 130°C and 200°C ~~and identical or not to the temperatures at which the precursor elastomer is mixed with the non oxidized bitumen~~, for a period of time that ranges of from between 10 minutes and 180 minutes, to form the cross-linked and/or functionalized bitumen/polymer reaction product.

29 (currently amended): The method as set forth in claim 19, ~~characterized in that~~ wherein the elastomer is functionalized and one or several reactive additives likely to react with the functional groupings of the elastomer are incorporated into the functionalized bitumen/polymer composition during its preparation where the quantity of the reactive additive(s) ranges from 0.05% to 5% of the weight of the bitumen present in the composition.

30 (new): The method as set forth in claim 10, wherein the precursor elastomer consists of at least one copolymer selected from the group consisting of random and block copolymers of styrene and butadiene, isoprene, chloroprene, carboxylic butadiene or carboxylic isoprene.